

CLAIMS

1. A discharge lamp lighting apparatus comprising:

a power conversion unit (1) for converting a DC power supply voltage to a desired voltage;

5 an inverter (2) for inverting a polarity of an output from the power conversion unit (1) and supplying an alternating output to a discharge lamp load;

a lamp voltage detection unit (6) for detecting a voltage value corresponding to a tube voltage of the discharge lamp;

10 a lamp current detection unit (7) for detecting a current value corresponding to a tube current of the discharge lamp; and

a control unit (5) for controlling an output of the inverter to be supplied to the discharge lamp depending on the detection results of the lamp voltage and lamp current detection units (6, 7),

15 wherein the control unit comprises electrode heating amount setting means which sets an alternation time of the output power to be supplied to the discharge lamp in an electrode heating period for actuation of the discharge lamp to be longer than an alternation time thereof in a steady lighting period thereof, and which increases the alternation time in the
20 electrode heating period to be longer than a normal alternation time thereof, depending on a lowering degree of a lamp power or a lamp current supplied to the discharge lamp.

2. The discharge lamp lighting apparatus according to claim 1, wherein
25 the electrode heating amount setting means determines the alternation time

of the output power in the electrode heating period when an accumulated value of a lamp current with respect to a time lapse becomes a first predetermined value, so that the first predetermined value of the lamp current accumulated value is variably increased depending on the lowering
5 degree of the power or current supplied to the discharge lamp.

3. The discharge lamp lighting apparatus according to claim 1, wherein the electrode heating amount setting means determines the alternation time of the output power in the electrode heating period when an accumulated
10 value of a lamp current with respect to a time lapse becomes a first predetermined value, so that the timing of the alternation is delayed by a first predetermined time.

4. The discharge lamp lighting apparatus according to any one of claims
15 1 to 3, wherein the control unit includes a power supply voltage detection unit (20) for detecting a voltage of the DC power supply and a means (11, 18) for lowering a power or a current supplied to the discharge lamp depending on a lowering degree of the power supply voltage, and wherein the electrode heating amount setting means increases the alternation time
20 in the electrode heating period depending on the lowering degree of the power supply voltage.

5. The discharge lamp lighting apparatus according to any one of claims
25 1 to 4, wherein the control unit includes a temperature detection unit (21) for detecting a temperature of the discharge lamp lighting apparatus and

having a function of lowering a power or a current supplied to the discharge lamp depending on an increase of the temperature, and the electrode heating amount setting means increases the alternation time in the electrode heating period depending on the rise of the temperature.

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6. The discharge lamp lighting apparatus according to any one of claims 1 to 3, wherein the electrode heating amount setting means increases the alternation time in the electrode heating period when a value of a power or a current supplied to the discharge lamp is lower than a second predetermined value.

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7. The discharge lamp lighting apparatus according to any one of claims 1 to 3, wherein the electrode heating amount setting means increases the alternation time in the electrode heating period when a state in which a value of a power or a current supplied to the discharge lamp is continuously lower than a second predetermined value for a second predetermined time.

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8. The discharge lamp lighting apparatus according to claim 6 or 7, wherein the control unit includes a lamp state detecting means (10) for detecting an initial lamp state at the time of actuation start, and means (22) for variably setting the second predetermined value depending on the detected initial lamp state.

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9. The discharge lamp lighting apparatus according to any one of claims 1 to 8, wherein the electrode heating amount setting means determines

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whether the alternation time is increased or not after a third predetermined time passes from the start of the discharge lamp actuation or from an alternation of an output power in the electrode heating period.

5 10. The discharge lamp lighting apparatus according to any one of claims
1 to 8, wherein the electrode heating amount setting means determines
whether the alternation time is increased or not after an accumulated value
of a lamp current from the start of the discharge lamp or alternation of an
output power with respect to a time lapse exceeds a second predetermined
10 value in the electrode heating period.

11. The discharge lamp lighting apparatus according to claim 4, wherein
the electrode heating amount setting means increases a degree of increment
of the alternation time in the electrode heating period as the power supply
15 voltage is lower.

12. The discharge lamp lighting apparatus according to claim 5, wherein
the electrode heating amount setting means adjusts the degree of the
increase of the alternation time so that the degree of the alternation time in
20 the electrode heating period is made greater as the detection temperature of
the discharge lamp lighting apparatus is higher.

13. The discharge lamp lighting apparatus according to any one of claims
6 to 8, wherein the electrode heating amount setting means increases a
25 degree of increment of the alternation time in the electrode heating period

as the power value or current value supplied to the discharge lamp is lowered in amount with respect to the second predetermined value of the power value or current value.

5 14. The discharge lamp lighting apparatus according to any one of claims
6 to 8, wherein the electrode heating amount setting means accumulates a
lowering amount of the power value or current value supplied to the
discharge lamp with respect to the second predetermined value of the power
value or current value, and increases a degree of increment of the
10 alternation time in the electrode heating period as the accumulated value is
greater.

15 15. The discharge lamp lighting apparatus according to claim 8, wherein
the electrode heating amount setting means (18) increase the alternation
time in the electrode heating period depending on the output of the lamp
state detecting means (10).

20 16. The discharge lamp lighting apparatus according to claim 6 or 7,
wherein the electrode heating amount setting means increases a degree of
increment of the alternation time in the electrode heating period, as a time
(t') while a state in which the power value or the current value supplied to
the discharge lamp is lower than the second predetermined value is
continued is longer.

25 17. The discharge lamp lighting apparatus according to any one of claims

1 to 16, wherein the electrode heating amount setting means determines whether the alternation time is increased or not each alternation of the output power.

5 18. The discharge lamp lighting apparatus according to any one of claims 1 to 16, wherein the electrode heating amount setting means makes first determination whether the alternation time is increased or not just after starting the discharge lamp actuation within the electrode heating period, and the alternation time of the inverter output in the electrode heating
10 period thereafter is made to be the same state as that made by the first determination.

19. The discharge lamp lighting apparatus according to any one of claims 1 to 18, wherein the discharge lamp is a metal halide lamp which does not
15 contain mercury in an arc tube.

20. A lamp system comprising the discharge lamp lighting apparatus according to any one of claims 1 to 19.